## 8.6 Public Health

The Henrietta Peaker Project (HPP) consists of a 91.4-megawatt (MW) (net), natural-gas-fired, simple-cycle power plant located approximately 10 miles southwest of Lemoore, California, on a seven-acre portion of a 20-acre parcel owned by GWF Energy LLC. The HPP will interconnect to the existing adjacent Pacific Gas and Electric Company (PG&E) Henrietta Substation through a new 550-foot 70-kilovolt (kV) transmission line supported on two new transmission poles. Other linear facilities include an approximately 16.5-foot water interconnection pipeline (from the site property boundary) and a 2.2-mile Southern California Gas Company natural gas interconnection pipeline. Additionally, approximately five acres will be used for temporary construction laydown and parking.

This section contains the methodology and results of the human health risk assessment (HRA) for the HPP. The purpose of the HRA is to evaluate potential public exposure to pollutant emissions from routine operations. Potential public exposure during upset conditions is addressed in Section 8.12 (Hazardous Materials Handling). This section also addresses exposure to electric and magnetic fields. A detailed analysis of electric and magnetic field strengths at the edge of the right-of-way for the proposed transmission line is provided in Section 6.2, Transmission Line Electrical Effects.

### 8.6.1 Affected Environment

The nearest public receptors to the HPP site are workers, residences, and the two neighboring businesses. The nearest residences are approximately 1.5 miles northeast. The nearest business is the New Star facility (0.7 miles south), but this facility is currently not operating. The closest operating business is Naval Air Station (NAS) Lemoore, located approximately one mile north of the facility. There are no other sensitive receptors within a one-mile radius of the proposed HPP site.

The HPP turbine stacks would exhaust combustion gases at 85 feet (25.9 meters) above grade elevation. Topographical features within a 10-mile radius that are of equal or greater elevation than the assumed stack exhaust exit point (i.e., stack height plus grade elevation, which is 309 feet or 94 meters) are shown on Figures 8.6-1a and 8.6-1b.

Sensitive receptors are defined as groups of individuals that may be more susceptible to health risks due to chemical exposure. Schools (public and private), day care facilities, convalescent homes, and hospitals are of particular concern. Figure 8.6-2 shows sensitive receptors within a 10-mile radius of the proposed facility. This figure is provided at a scale of 1:24,000. The closest sensitive receptor is the Empire School located approximately 3.9 miles east of the HPP.

### 8.6.2 Environmental Consequences

This section describes the potential public health risks due to construction and operation of the HPP, the methodology and results of the HRA, the uncertainties in the HRA, and other potential health impacts.

#### 8.6.2.1 Construction Emissions

Due to the relatively short duration of the construction (i.e., approximately five months), significant long-term public health effects are not expected. To ensure worker safety during construction, safe work practices will be followed (see Section 8.7, Worker Health and Safety). A detailed analysis of the potential environmental impacts due to criteria pollutant emissions during construction and operation and the control of these emissions is provided in Section 8.1 (Air Quality).

#### 8.6.2.2 Operational Emissions

Facility operations were evaluated to determine whether substances used or generated at the HPP could cause adverse health effects if released to the air. The sources of potential emissions from facility operations include the natural-gas-fired combustion turbine generators (CTGs) and the emergency generator. The substances emitted from turbine operations that have potential toxicological impacts are shown in Table 8.6-1. These potential air toxic species were identified from the California Air Toxics Emission Factor (CATEF) II database (CARB, 2001). All air toxic species associated with Source Classification Code (SCC) 20200203 (natural-gas-fired CTGs with selective catalytic reduction [SCR]) are included in Table 8.6-1. Ammonia emissions associated with potential ammonia slip from the SCR system are calculated from the permit limit maximum of 10 parts per million by volume, dry (ppmvd) at 15 percent oxygen. Diesel particulate emissions from the emergency generator are calculated from manufacturer's data. More detailed information on the chemicals stored and used onsite, associated potential impacts, and potential accidental chemical releases is included in Section 8.6.3.1.

Turbine emissions were estimated by assuming that both turbines would operate simultaneously under normal load conditions. The turbine emission factors, in units of pounds per million standard cubic feet (lb/MMscf) of natural gas, were multiplied by the amount of gas combusted per hour to obtain emissions in units of pounds per hour (lb/hr). For maximum hourly emissions, the maximum natural gas consumption rate of 0.496 MMscf per hour per turbine was used (100 percent load at 15 °F ambient temperature). For annual emissions, the annual average natural gas consumption rate of 0.470 MMscf per hour per turbine was used (100 percent load at 63 °F ambient temperature), assuming that the turbines would operate 8,100 hours per year (including startups and shutdowns). Routine testing emissions from the emergency generator assumed operation for 15 minutes once per week. The emission factors and estimated maximum hourly and annual emissions are summarized in Table 8.6-2.

### 8.6.2.3 Public Health Impact Assessment Approach

The potential human health risks posed by the project's emissions were assessed using procedures consistent with the California Air Pollution Control Officers Association (CAPCOA) *Air Toxics "Hot Spots" Program: Revised 1992 Risk Assessment Guidelines* (CAPCOA, 1993). The CAPCOA guidelines were developed to provide risk assessment procedures as required under the Air Toxics Hot Spots Information and Assessment Act of 1987, Assembly Bill (AB) 2588 (Health and Safety Code Sections 44360 et seq.). The Hot Spots law established a statewide program for the inventory of air toxic emissions from individual facilities as well as requirements for risk assessment and public notification of potential health risks.

The HRA was conducted in four steps:

1. Hazard Identification

2. Dose-Response Assessment
3. Exposure Assessment
4. Risk Characterization

First, hazard identification was performed to determine the potential health effects that may be associated with emissions from the HPP. The purpose was to identify whether pollutants emitted could be characterized as potential human carcinogens or associated with other types of adverse health effects. The chemicals evaluated in this analysis (Table 8.6-1) were identified from the CAPCOA guidelines (CAPCOA, 1993), the California Office of Environmental Health Hazard Assessment (OEHHA) *California Cancer Potency Factors* (Cal-EPA, 2001a), OEHHA's *Determination of Acute Reference Exposure Levels for Airborne Toxicants* (Cal-EPA, 1999), and *Determination of Chronic Reference Exposure Levels* (Cal-EPA, 2000a, 2000b, and 2001b).

Second, a dose-response assessment was performed to characterize the relationship between pollutant exposure and the incidence of an adverse health effect in exposed populations. The dose-response relationship is expressed in terms of potency values (i.e., unit risk factors or URFs) for cancer risk and reference exposure levels (RELs) for acute and chronic noncancer risks. The CAPCOA and OEHHA documents identified above provide a list of pollutants and their associated URFs and RELs.

Third, an exposure assessment was conducted to estimate the extent of public exposure to the emissions from the HPP. Public exposure is dependent on the short- and long-term ground-level concentrations resulting from emissions, the route of exposure, and the duration of exposure to those emissions. Dispersion modeling was performed using the ISCST3 model to estimate the ground-level concentrations near the project site. The methods used in the dispersion modeling were consistent with the approach described in Section 8.1 (Air Quality). The exposure pathways included in this analysis were inhalation, soil ingestion, dermal, ingestion of locally produced plants and produce, and mother's milk. Analysis of exposure through other pathways was determined to be unnecessary due to the location of the project site. The duration of exposure to emissions from the HPP was conservatively assumed to be 24 hours per day, 365 days per year, for 70 years even though the facility has a planned 30-year operating life.

Fourth, risk characterization was performed to integrate the health effects and public exposure information and provide qualitative estimates of health risks. Risk modeling was performed using the ACE2588 model to estimate cancer and noncancer health risks. The ACE2588 model utilizes CAPCOA equations and algorithms (CAPCOA, 1993) to calculate health risks based on input parameters such as emissions, "unit" ground-level concentrations, and toxicological data. A detailed description of the model input parameters and results of the HRA are provided below.

### 8.6.2.4 Model Input Parameters

The HRA was conducted using worst-case turbine emissions (short- and long-term). Cancer and chronic noncancer health effects were estimated using the annual turbine emission estimates coupled with annual stack parameters (both 100 percent load at 63 $^{o}$F ambient temperature) and annualized emissions from routine emergency generator testing. Acute noncancer health effects were estimated using the worst-case maximum hourly emissions (100 percent load at 15 $^{o}$F ambient temperature) coupled with low-flow stack parameters (start-up/shutdown conditions) and emissions during generator testing averaged over a one-hour period. The emissions values in lb/hr were converted to grams per second (g/s) for use as input to the ACE2588 model.

Dispersion modeling was performed using the ISCST3 model and methods consistent with the approach described in Section 8.1 (Air Quality) of this Application for Certification (AFC). As prescribed by the ACE2588 model, the dispersion modeling was conducted using emission rates of 1 g/s. The results using 1 g/s emission rates produced "unit" ground-level concentrations, which were input to the ACE2588 model. The ACE2588 model, using the turbine emission rates (provided in the input file as described above) and the unit ground-level concentrations (provided from the dispersion modeling), calculated ground-level concentrations for each chemical species. The meteorological data used for the HRA were the same data used in the air quality analysis, presented in Section 8.1.

Toxicological factors (URFs and RELs) were obtained from the most recently updated factors published by OEHHA (Cal-EPA 2000a, 2000b, 2001a, and 2001b). The pollutant-specific URFs and RELs used in the HRA are listed in Table 8.6-3. The ACE2588 model uses the toxicological data, in conjunction with the other input data described above, to perform health risk estimates based on CAPCOA equations and algorithms.

#### 8.6.2.5 Calculation of Health Effects

Adverse health effects are expressed as cancer or noncancer health risks. Cancer risk is typically reported as "lifetime cancer risk." Lifetime cancer risk is the maximum estimated increased risk of contracting cancer caused by long-term exposure to a pollutant suspected of being a carcinogen. Cancer risk is calculated by assuming an individual is exposed continuously to pollutants for 24 hours per day for 70 years. Although the continuous lifetime exposure is unlikely, the goal of the approach is to produce a worst-case estimate of potential cancer risk. Noncancer risk is typically reported as a "total hazard index" (THI). The THI is calculated for each target organ as the sum of the ratios of each chemical's estimated exposures divided by the maximum acceptable exposure level (or the REL) of that pollutant. The acceptable exposure level is generally the level at (or below) which no adverse health effects are expected. The THI is calculated for short-term (acute) and long-term (chronic) exposures.

The cancer and noncancer risk estimates provided in this HRA represent incremental risks (i.e., risks due to the HPP only) and do not include potential health risks posed by existing background concentrations. The ACE2588 model performs all of the necessary calculations to estimate the potential lifetime cancer risk and acute and chronic THIs posed by the proposed project emissions.

#### 8.6.2.6 Health Effects Significance Criteria

State and local agencies provide varying significance criteria for cancer and noncancer health effects. For the HPP, the California Energy Commission (CEC) Guidelines provide the most stringent significance criteria for potential cancer and noncancer health effects from project-related emissions. For carcinogenic health effects, an exposure is considered potentially significant when the predicted lifetime cancer risk exceeds one in 1 million

($1.0 \times 10^{-6}$). For noncarcinogenic health effects, an exposure that affects a target organ is considered potentially significant when the acute or chronic THI exceeds a value of 1.

### 8.6.2.7 Estimated Lifetime Cancer Risk

The maximum incremental cancer risk resulting from the project's emissions was estimated to be 0.0296 in 1 million, at a location approximately 2.2 miles to the southeast of the turbines at an elevation of 216 feet (receptor #104 in ACE output file, 240,400 meters east, 4,010,900 meters north Universal Transverse Mercator [UTM] Coordinate System). The estimated cancer risk at all sensitive receptors would be less than this maximum. The maximum cancer risk was modeled with the maximum annual operating scenario (100 percent load at 63 °F ambient temperature). Table 8.6-4 presents the detailed cancer results of the HRA for the HPP. Applicable excerpts of the ACE2588 model output can be found in Appendix E.

The estimated cancer risks are well below the significance criteria of one in 1 million. Thus, the HPP does not pose significant health effects, based on analysis using the most stringent significance criteria established for carcinogenic health effects.

### 8.6.2.8 Estimated Chronic and Acute Total Hazard Indices

The maximum chronic THI resulting from project emissions was estimated to be 0.000785, approximately 2.2 miles southeast of the turbines at an elevation of 216 feet (receptor #104 in ACE output file, 240,400 meters east, 4,010,900 meters north UTM). The maximum chronic THI was modeled with the maximum annual operating scenario (100 percent load at 63 °F ambient temperature). The maximum acute THI resulting from the project's emissions was estimated to be 0.0035, at a location approximately 0.1 mile southeast of the turbines at an elevation of 223 feet (receptor #76 in ACE output file, 239,200 meters east, 4,014,150 meters north UTM). The maximum acute THI was modeled using startup stack parameters. The estimated THI's at all sensitive receptors would be less than these maximums. Table 8.6-4 presents the detailed noncancer results of the HRA for the HPP.

The estimated chronic and acute THIs are well below the significance criteria of one. Thus, the HPP emissions do not pose significant health effects, based on analysis using the most stringent significance criteria established for noncarcinogenic health effects.

#### 8.6.2.9 Uncertainty in the Public Health Impact Assessment

Sources of uncertainty in HRAs include emissions estimates, dispersion modeling, exposure characteristics, and extrapolation of toxicity data in animals to humans. Assumptions used in HRAs are designed to provide sufficient health protection to avoid underestimation of risk to the public. Some sources of uncertainty applicable to this HRA are discussed below.

The turbine emission rates were derived using vendor data for ammonia slip and diesel particulate exhaust from the emergency generator and data from the CATEF II database (CARB, 2001) for the other air toxics. The short-term turbine emissions were developed assuming all turbines would operate at the same time and at the maximum heat input rate. Long-term turbine emissions were estimated based on 100 percent load at an average ambient temperature of 63 °F and 8,100 hours per year operation. Under actual operating conditions, the turbines may operate less than 8,100 hours per year, or the typical loads could be lower. Consequently, the emissions used for this HRA are likely to be higher than levels that would be experienced under normal operation of the turbines.

The models used in dispersion modeling contain assumptions that tend to overpredict ground-level concentrations. For example, the modeling performed in the HRA assumed a conservation of mass (i.e., all of the pollutants emitted from the sources remained in the atmosphere while being transported downwind). During the transport of pollutants from sources to receptors, none of the material was assumed to be removed through chemical reaction or to be lost at the ground surface through reaction, gravitational settling, or turbulent impaction. In reality, these mechanisms work to reduce the level of pollutants remaining in the atmosphere.

The exposure characteristics assessed in the HRA included the assumption that residents were exposed to turbine emissions continuously at the same location for 24 hours per day, 365 days per year, for 70 years. It is extremely unlikely that any person would meet this condition. The conservative exposure assumptions tend to overpredict risk estimates in the HRA process.

The toxicity data used in the HRA contain uncertainties due to the extrapolation of data from animals to humans. Typically, safety factors are applied when doing the extrapolation. Furthermore, the human population is much more diverse, both genetically and culturally, than bred experimental animals, and thus the intraspecies variability among humans is expected to be much greater than in laboratory animals. With all of the uncertainty in the assumptions used to extrapolate toxicity data, significant measures are taken to ensure that there is sufficient health protection built into the available health effects data.

#### 8.6.2.10 Criteria Pollutants

The criteria pollutants (nitrogen oxides, carbon monoxide, sulfur dioxide, and particulate matter) were modeled, and an evaluation of their impacts on air quality is provided in Section 8.1 (Air Quality). The national and California ambient air quality standards (NAAQS/CAAQS) set limits on the allowable level of air pollutants in the ambient air necessary to protect public health. The results show that the NAAQS/CAAQS for the above pollutants are not exceeded as a result of operation of the HPP, with the exception of particulate matter ($PM_{10}$) under the California standards. Current $PM_{10}$ levels already exceed the CAAQS in the project area. However, $PM_{10}$ impacts from the HPP were shown to have an insignificant contribution to CAAQS violations. Because the results indicate compliance with the NAAQS/CAAQS, no significant adverse health effects are anticipated from HPP criteria pollutant emissions.

### 8.6.3 Other Public Health Risks

#### 8.6.3.1 Chemicals Stored and Used Onsite

Aqueous ammonia will be stored and used onsite. In the extremely unlikely event of an accidental release of aqueous ammonia there would be a potential to adversely affect public health. Refer to Section 8.12 (Hazardous Materials Handling) for an assessment of potential offsite consequences and measures proposed to minimize the potential health risk. With the incorporation of these measures public health risk from exposure to ammonia is reduced to insignificant levels.

The HPP will coordinate with local emergency response units by providing them with copies of the emergency response plan, conducting a plant site tour to point out the locations of hazardous materials and safety equipment, and encouraging periodic emergency response drills.

#### 8.6.3.2 Electromagnetic Field Exposure

Electric and magnetic field (EMF) strengths produced by the proposed transmission line are provided in Section 6.2.4 of this AFC. Section 6.0 (Electric Transmission) discusses aviation safety, corona effects, and the strength of the electric and magnetic fields produced by the proposed transmission line. The remainder of this section addresses human health effects from exposure to electric and magnetic fields from the proposed transmission line.

**Introduction.** Energized electrical conductors produce electric fields. Conductors that carry electrical current also produce magnetic fields. Concern about the health effects from exposure to electric and magnetic fields in humans dates from the 1960s. Wertheimer and Leeper (1979) reported that children who lived in homes close to certain types of electric power transmission and distribution lines had a small but elevated risk of childhood leukemia. In 1988, a follow-up study found essentially the same risk (Savitz et al., 1988). However, the Savitz study also measured the strength of magnetic fields from nearby power lines and found no significant association with childhood cancer. A third study (London et al., 1991) agreed with the 1979 Wertheimer and Leeper study.

In January 1991, the California Public Utilities Commission (CPUC) issued an Order Instituting Investigation (I.91-01-012; CPUC, 1991) into the potential health effects from electric and magnetic fields emitted by electric power and cellular telephone facilities. In September 1991, the assigned CPUC judge issued a ruling that created the California EMF Consensus Group. This group of representatives from utilities, industry, government, private and public research, and labor organizations submitted a report entitled *Issues and Recommendations for Interim Response and Policy Regarding Power Frequency EMFs* on

March 20, 1992. The report stated that the CPUC should recommend that utilities take public concern about electromagnetic fields into account when siting new electric facilities. Although this group could not conclude that there is a relationship between EMF and human health effects, they also could not conclude that this relationship does not exist; therefore, they recommended that the CPUC authorize further research.

As a result of the concern raised in these and other studies, Congress in 1991 asked the National Academy of Sciences to review the research literature and determine whether there was sufficient basis to assess the health risks of electric and magnetic fields. In response, the National Research Council (NRC) of the Academy convened the Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems. After examining more than 500 studies spanning 17 years of research, the committee concluded in an October 1996 report: "No conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects or reproductive and developmental effects" (NRC, 1996).

On June 27, 1998, a 28-member advisory panel sponsored by the National Institute of Environmental Health Science (NIEHS), part of the National Institute of Health, voted 19 to 9 to label EMFs a "possible human carcinogen," which allowed for continued funding of government studies. On May 4, 1999, NIEHS issued a report entitled *Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields* (NIEHS, 1999). This report found that the evidence is "weak" that electric and magnetic fields cause cancer. The report concludes: "The NIEHS believes that the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm." While the report says EMF exposure "cannot be recognized as entirely safe," the report goes on to say "… the conclusion of the report is insufficient to warrant aggressive regulatory action." Because virtually everyone in the United States is exposed to EMF, the report recommends that "… passive regulatory action is warranted such as continued emphasis on educating both the public and the regulatory community on means aimed at reducing exposures," but that cancer and noncancer health outcomes do not provide "… sufficient evidence of a risk to warrant current concern."

**Project Impacts.** The HPP transmission line would produce maximum electric fields of approximately 0.63 kilovolts per meter (kV/m) within the right-of-way of the new HPP Generator Tie-line. These fields would drop off with distance away from the transmission line and would be approximately 0.29 kV/m at the edge of right-of-way. Magnetic fields would peak at approximately 67.5 milligauss (mG) in the center of the right-of-way and would also drop off with distance, to a value of approximately 46 mG at the edge of the right-of-way.

Although several states have set standards to limit exposure to electric and magnetic fields from transmission power lines, California has not done so. Even so, the electric and magnetic field levels produced by this transmission line would be well below the standards that apply in other states. States with regulations have edge-of-right-of-way standards for electric fields ranging from 1 to 3 kV/m, and for magnetic fields ranging from 150 to 200 mG (for 230-kV transmission lines) (see Section 6.2.4). Also, several organizations have set occupational standards for EMF exposure that are many times greater than the field levels set by states for residential exposure (Table 8.6-5). The electric and magnetic fields produced by the HPP transmission line would be well below all of these levels.

Given the current knowledge of this subject, the electric and magnetic field levels expected at the edge of the right-of-way of the new HPP Generator Tie-line do not present a risk of adverse health consequences. Similarly, adverse health consequences are not expected from secondary shock, as discussed in Section 6.2.5. In addition, the nearest residence is approximately 1.5 miles from the edge of the HPP Generator Tie-line right-of-way. The electric and magnetic field exposure from the proposed transmission line to people living in that location would be insignificant. Any exposure to electric and magnetic fields in that or other residences would occur primarily from the power lines serving the homes and from wiring and appliances within the homes, not from the HPP transmission line.

#### 8.6.3.3 Cumulative Impacts

Sections 8.6.2.7 and 8.6.2.8 presented the estimated cancer and noncancer health risks associated with the HPP. These data indicate that the HPP would not present significant health risks. Cumulative health impacts are effects associated with operation of other power projects in the area combined with effects of the proposed project. There are no other proposed power projects within six miles of the HPP.

### 8.6.4 Laws, Ordinances, Regulations, and Standards

The applicable laws, ordinances, regulations, and standards (LORS) related to public health impacts from the HPP are as follows:

**California Public Resource Code Section 2553(a); 20 California Code of Regulations (CCR) Sections 1752, 1752.5, 2300–2309, and Division 2, Chapter 5, Article 1, Appendix B, Part (I).** This code provides HRA guidelines to assist in the evaluation of potential health impacts of a proposed project. The requirements include a quantitative HRA. The administering agency for this authority is the CEC.

**California Health and Safety Code Sections 2550–25542; 10 CCR Sections 2720–2734.** This code establishes inventory, reporting, business, and area planning requirements with respect to hazardous and acutely hazardous materials in accordance with the federal Emergency Planning and Community Right-to-Know Act of 1986. It requires preparation of risk management and prevention plans where acutely hazardous materials are used, and requires development and implementation of a business plan for emergency responses to a release or threatened release of the hazardous materials or mixtures. The administering agencies for this authority are the Office of Emergency Services and the Kings County Department of Public Health, Division of Environmental Health Services.

**California Clean Air Act, California Health and Safety Code Section 39650 et seq.** This code requires that the California Air Resources Board (CARB) and the state establish safe exposure limits for toxic air pollutants and identify pertinent best available control technologies (BACT). It requires that the new source review (NSR) rule for each air pollution control district include regulations that require new or modified procedures for controlling the emissions of toxic air contaminants (TACs). According to this code, CARB has developed cancer potency estimates for several carcinogenic pollutants to use in assessing the carcinogenic risk associated with exposure to these pollutants. The administering agencies for this authority are CARB and the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD).

**California Health and Safety Code, Part 6, Section 44300 et seq.** This law requires facilities that emit large quantities of a criteria pollutant, and that emit any quantity of a toxic contaminant, to provide the local air pollution control district with an inventory of toxic emissions. Such facilities may also be required to prepare a quantitative HRA. The administering agency for this law is SJVUAPCD.

### 8.6.5 Agency Contacts

Agency contacts regarding public health assessment of the HPP are as follows:

| Agency | Contact/Title | Telephone |
|---|---|---|
| Kings County Division of Environmental Health | Keith Winkler, Director<br>330 Campus Drive<br>Hanford, CA 93230 | (559) 584-1411 x2625 |
| San Joaquin Valley Unified Air Pollution Control District | David Warner<br>Permit Services Manager, Central Region<br>1990 E. Gettysburg Avenue<br>Fresno, CA 93726 | (559) 230-6000 |

### 8.6.6 Permits/Additional Approvals with Agencies

No permits or additional approvals are required.

### 8.6.7 Compliance with Laws, Ordinances, Regulations, and Standards

Applicable LORS and the administering agencies are summarized in Table 8.6-6. This table also shows the sections where HPP conformance with the LORS pertaining to public health is discussed.

### 8.6.8 Proposed Conditions of Certification

The proposed conditions of certification are contained in the Air Quality and Hazardous Materials sections of Appendix K. These conditions are proposed to ensure compliance with applicable LORS and/or to reduce potentially significant impacts to less-than-significant levels.

### 8.6.9 References


California Air Pollution Control Officers Association (CAPCOA), 1993. *Air Toxics "Hot Spots" Program: Revised 1992 Risk Assessment Guidelines.*

California Air Resources Board (CARB), 2001. California Air Toxic Emission Factor (CATEF) II database. March 5.

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London, Stephanie J., Duncan C. Thomas, Joseph D. Bowman, Eugene Sobel, Tsen-Chung Cheng, and John M. Peters, 1991. "Exposure to Residential Electric and Magnetic Fields and Risk of Childhood Leukemia." *American Journal of Epidemiology,* Volume 134, Number 9. November 1.

National Institute of Environmental Health Sciences (NIEHS), 1999. *Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*. National Institute of Health. May 4.

National Research Council (NRC), 1996. *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields.* National Research Council. National Academy Press. November 18.

Savitz, David A., Howard Warchtel, Frank A. Barnes, Esther M. John, and Jiri G. Tvrdik, 1988. "Case-Control Study of Childhood Cancer and Exposure to 60-Hz Magnetic Fields." *American Journal of Epidemiology,* Volume 126, Number 1.

Wertheimer, Nancy, and Ed Leeper, 1979. "Electrical Wiring Configurations and Childhood Cancer." *American Journal of Epidemiology,* Volume 109, Number 3.

# TABLES

**Table 8.6-1**
**List of AB2588 Air Toxics Emitted from**
**Operation of Natural-Gas-Fired Combustion Turbines with SCR**

| Chemical | Carcinogen | Chronic Noncarcinogen | Acute Noncarcinogen |
|---|---|---|---|
| 1,3-Butadiene | X | X | |
| Acetaldehyde | X | X | |
| Ammonia | | X | X |
| Benzene | X | X | X |
| Ethylbenzene | | X | |
| Formaldehyde | X | X | X |
| Hexane | | X | |
| Naphthalene | | X | |
| PAHs[a] | X | | |
| Propylene | | X | |
| Propylene Oxide | X | X | X |
| Toluene | | X | X |
| Xylenes | | X | X |
| Diesel Particulate[b] | X | X | |

[a] Polycyclic aromatic hydrocarbons, excluding naphthalene.
[b] Emitted from diesel-fired emergency generator.

SCR =Selective Catalytic Reduction

AB2588 =Assembly Bill 2588, Air Toxics "Hot Spots" Information and Assessment Act of 1987

**Table 8.6-2**
**Estimated Air Toxic Emission Factors and Emissions from Operation of Natural-Gas-Fired Combustion Turbines with SCR**

| Chemical Species | Emission Factor[a] (lb/MMscf) | Maximum Hourly Emissions Per Turbine (lb/hr) | Annual Emissions Per Turbine (ton/yr) |
|---|---|---|---|
| Acetaldehyde | $1.37 \times 10^{-1}$ | 0.068 | 0.26 |
| Ammonia[b] | - | 14.52 | 52.49 |
| Benzene | $1.33 \times 10^{-2}$ | 0.0066 | 0.025 |
| 1,3-Butadiene | $1.27 \times 10^{-4}$ | 0.000063 | 0.00024 |
| Ethylbenzene | $1.79 \times 10^{-2}$ | 0.0089 | 0.034 |
| Formaldehyde | $9.17 \times 10^{-1}$ | 0.45 | 1.75 |
| Hexane | $2.59 \times 10^{-1}$ | 0.13 | 0.49 |
| Naphthalene | $1.66 \times 10^{-3}$ | 0.00082 | 0.0032 |
| PAHs[c] | $6.60 \times 10^{-4}$ | 0.00033 | 0.0013 |
| Propylene | $7.71 \times 10^{-1}$ | 0.38 | 1.47 |
| Propylene oxide | $4.78 \times 10^{-2}$ | 0.024 | 0.091 |
| Toluene | $7.10 \times 10^{-2}$ | 0.035 | 0.14 |
| Xylenes | $2.61 \times 10^{-2}$ | 0.013 | 0.050 |
| Diesel Particulate[d] | -- | 0.0275[d] | 0.00072[d] |

[a] Air toxic emission factors from CATEF database, Version 1.2 (CARB, 2001).
[b] Based on estimated ammonia slip from NOx control (10 ppmvd at 15 percent oxygen).
[c] Polycyclic aromatic hydrocarbons (excluding naphthalene).
[d] Emergency generator diesel particulate emissions calculated from vendor specifications (full load for 15 minutes).

SCR = selective catalytic reduction
lb/MMscf = pounds per million standard cubic feet
ppmvd = parts per million by volume, dry

**Table 8.6-3**
**Cancer, Chronic, and Acute Risk Factors**

| Compound | Cancer Unit Risk Factor ($\mu g/m^3)^{-1}$ | Chronic Reference Exposure Level ($\mu g/m^3$) | Acute Reference Exposure Level ($\mu g/m^3$) |
|---|---|---|---|
| Acetaldehyde | $2.70 \times 10^{-6}$ | 9 | — |
| Ammonia | — | 200 | 3,200 |
| Benzene | $2.90 \times 10^{-5}$ | 60 | 1,300 |
| 1,3-Butadiene | $1.70 \times 10^{-4}$ | 20 | — |
| Ethylbenzene | — | 2,000 | — |
| Hexane | — | 7,000 | — |
| Formaldehyde | $6.00 \times 10^{-6}$ | 3 | 94 |
| Naphthalene | — | 9 | — |
| PAHs[a] | $1.10 \times 10^{-3}$ | — | — |
| Propylene | | 3,000 | — |
| Propylene Oxide | $3.70 \times 10^{-6}$ | 30 | 3100 |
| Toluene | — | 300 | 37,000 |
| Xylenes | — | 700 | 22,000 |
| Diesel Particulate | $3.00 \times 10^{-4}$ | 5 | — |

Sources: Cal-EPA, 2000a, 2000b, 2001a, and 2001b.
[a] Polycyclic aromatic hydrocarbons, excluding naphthalene (assume toxicity factor for benzo(a)pyrene).
— = Not applicable
$\mu g/m^3$ = micrograms per cubic meter

**Table 8.6-4**
**Estimated Cancer Risk and Acute and Chronic**
**Total Hazard Indices for the HPP**

| Cancer Risk at Maximum Point of Impact | Chronic Risk at Maximum Point of Impact | Acute Risk at Maximum Point of Impact |
|---|---|---|
| 0.0296 excess risk in 1 million | 0.000785 total hazard index | 0.0035 total hazard index |

**Table 8.6-5**
**60-Hz Magnetic Field International and Occupational Exposure Standards**

| Organization and Type of Standard | Application | Numeric Value of Allowed Exposure |
|---|---|---|
| American Conference of Governmental Industrial Hygienists; threshold limit value (TLV) | Occupational exposure to whole body | 1 mT (10,000 mG) |
| | Occupational exposure to extremities | 5 mT (50,000 mG) |
| | Persons wearing cardiac pace makers | 0.1 mT (1,000 mG) |
| International Non-Ionizing Radiation Committee of the International Radiation Protection Association (IRPA/INIRC); guideline | Occupational 8-hour time-weighted average guideline exposure to whole body | 200 mT (2,000,000 mG) |
| | Occupational peak exposure whole body | 2,000 mT (20,000,000 mG) |
| | Occupational exposure to extremities | 5,000 mT (50,000,000 mG) |
| | Exposure to general public | 40 mT (400,000 mG) |
| European Committee for Electrotechnical Standardization (CENELEC); standards | Occupational exposure (50 Hz) | 1.6 mT (16,000 mG) |
| | Exposure to general public (50 Hz) | 0.64 mT (6,400 mG) |
| Commission of the European Union (CEU); directives | Occupational exposure action level 2 requiring reduction of magnetic field exposure | 0.4 mT (4,000 mG) |

Hz = hertz
mT = millitesla
mG = milligauss

**Table 8.6-6**
**HPP Summary of Compliance with Public Health LORS**

| Authority | Administering Agency | Requirement | AFC Conformance Section |
|---|---|---|---|
| California Public Resources Code § 2553(a); 20 CCR § 1752.5, 2300–2309, and Division 2 Chapter 5, Article 1, Appendix B, Part(1) | CEC | HRA guidelines; requires quantitative HRA | Section 8.6 |
| H&SC § 39650, et seq. | CARB | Requires safe exposure limits for TACs, use of BACT, and NSR | HPP will not cause unsafe exposure to TACs (Section 8.6.2) and has performed an NSR assessment, including BACT (Section 8.1.3) |
| H&SC, Part 6, SS 44300 et seq. | SJVUAPCD | Inventory of TACs and HRA | Section 8.6.2 |

CARB = California Air Resources Board
CEC = California Energy Commission
HRA = Health Risk Assessment
H&SC = California Health and Safety Code
SJVUAPCD = San Joaquin Valley Unified Air Pollution Control District
TAC = Toxic Air Contaminant

# FIGURES